DEPARTMENT OF LAND RECORDS AND AGRICULTURE.

REPORT

OF THE

DEPARTMENT OF AGRICULTURE,

BOMBAY PRESIDENCY,

FOR THE YEAR

1904-1905.

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No. A/8343 of 1905.

From

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Director, Land Records and Agriculture, Bombay,
Poona;

To

The SECRETARY to GOVERNMENT,
Revenue Department, Bombay.

Poona, 4th December 1905.

Sir,

I have the honour to submit herewith the Annual Report of the Department of Agriculture for the year 1904-1905, prepared in accordance with the orders contained in Government Resolution No. 5509, dated 18th July 1904. The Annual Report of the Experimental Farms was published and distributed on 30th ultimo, and copies were submitted to Government on the same date. These orders direct that my report should deal with the year ending 31st July, but since it was not found possible in the current year for the officers of this Department to submit the Farm reports until the middle of August and for the Government Central Press to supply the printed reports complete until the end of November, I have included in this report some mention of matters of administrative interest up to 31st October, the date prescribed for reports of this Department in former years.

CHAPTER I.

Prefatory.

2. I was in charge of the Department from the 1st of August 1904 to 1st of February 1905 and again from the 1st of April onwards. Mr. A. S. A. Westropp held charge during the months of February and March when I was absent on privilege leave for one month and on special duty in the Punjab for one month. Mr. Mollison, Inspector General of Agriculture in India, visited the Presidency in November 1904, and Mr. F. G. Sly, Acting Inspector General of Agriculture, visited Poona, Belgaum, Dhárwár and Mahábaleshvar in my company, and conferred with the Local Government regarding the development of the Department in April 1905, and again accompanied me to Sind in October in order to examine the important experiments there being conducted in the introduction of Egyptian cotton.

3. In pursuance of the scheme for the development of Agricultural Research referred to in paragraph 3 of my last report, the Secretary of State for India has sanctioned the creation of posts of Professor of Agriculture, Economic Botanist and Agricultural Chemist in this Presidency. At the time of the presentation of the Imperial Budget in March, the Government of India announced that an annual grant of Rs. 20 lákhs would be made for agricultural development and that from this sum subventions would be granted to the several Provinces. An important programme of development in Agricultural and Veterinary education and Research was prepared involving an initial capital expenditure of some Rs. 14 lákhs and an ultimate recurring expenditure of some Rs. 6½ lákhs. This programme was accepted by the Government of Bombay and met with the approval of the Government of India in its general principles. A perpetual subvention of Rs. 3½ lákhs was sanctioned by the Government of India, a sum which if the Government of Bombay maintain undiminished, the scale of the existing Budget provision for agricultural purposes will enable us in the course of a few years to carry out the programme prepared in its entirety. The liberality of the Imperial grant deserves our grateful acknowledgments; in the view of rival claimants our share is excessive; but it may be fully justified by

the lead which this Government has taken in Agricultural Policy and by the advanced position which, in consequence, Agricultural Experiments occupy in this Presidency.

The principal points of the programme may be summarised as follows:—

Establishment.—The appointment of eight European specialists, of a superior Native Staff of Divisional Inspectors and Native Professors nine in number on salaries of Rs. 200 to Rs. 500 and a subordinate staff of some 120 men rising in gradation from Rs. 30 to Rs. 200.

Additional Farms.—Six farms to be established in connection with Irrigational Projects now under preparation;

Expansion of the farms at Surat and Dhárwár for the distribution of selected cotton seed;

Establishment of an Economic Botanical garden in the Konkan;

Establishment of three cattle breeding farms.

Education.—Creation of an Agricultural College and Research Institute at Poona;

Expansion and improvements of the Parel Veterinary College, Bombay.

NOTE.—Since the Imperial allotment has been granted for Agricultural and Veterinary developments jointly, I have included in this report references to veterinary matters which are usually dealt with in a separate veterinary report.

4. Mr. Fletcher was Deputy Director of Agriculture throughout the year and has performed his duties with great zeal and energy. The circumstances of the season have been very unfavourable to experimental work on the farms in his charge in the Presidency Proper, but in Sind he has initiated schemes of far-reaching importance to that Province. His services in regard to the introduction of Egyptian cotton there have been of exceptional value and have been brought to the favourable notice of Government.

5. Mr. Knight, who had been temporarily employed for two years in this Department, was confirmed in the newly created post of Professor of Agriculture from 11th October 1904. In addition to experimental farm work in the neighbourhood of Poona he has taught Agriculture and Agricultural Chemistry in the College of Science to a large number of students, conducted a special class for Assistant Collectors at Poona and reported on the country through which certain irrigational canals are projected. From November 1904 to February 1905 he managed the Agricultural Section of the important Exhibition which was held in Bombay in connection with the National Congress. Mr. Knight also completed a series of agricultural lessons for village schools. In April and May, Mr. Knight was absent on six weeks' privilege leave. Mr. Knight has disposed of his varied and laborious duties with ability and unflagging industry.

6. Mr. G. A. Gammie, F.L.S., of whose voluntary services to the Department in Botany I made mention in my last report, was appointed to the post of Economic Botanist from March 1905. Mr. Gammie held charge of the Ganesh Khind Botanical Gardens and of the Empress Gardens on behalf of the Agri-Horticultural Society of Western India. He lectured in Botany in the College of Science and continued his systematic classification of numerous plants including in particular cotton, jowári and wheat. His work has added to his reputation not only as a systematic Botanist but also as a practical Economic Botanist who can make the plants grow which he desires to observe.

7. Mr. A. A. Meggitt, B.Sc., London, was appointed to the post of Agricultural Chemist and joined his appointment at the end of August 1905.

8. Mr. P. R. Mehta was again temporarily lent to this Department for six months from February to August 1905 to assist in the work of collection and distribution of selected cotton seed and in the establishment of a new farm at Dhulia. Mr. Mehta performed his duties with his usual industry and intelligence.

9. The establishment of a superior native staff was commenced by the appointment of Mr. G. K. Kelkar, late Superintendent of the Poona Farm, as Divisional Inspector of Agriculture in the Deccan and of Mr. S. B. Mahli, a graduate of the Cirencester College to a similar post in Sind.

10. In connection with the extension of the cultivation of Egyptian cotton in Sind, Mr. Ali Mahomed, Manager of the Karáchi Municipal Farm, was lent to this Department on special duty. In exchange the Superintendent of the Mánjri Farm was temporarily transferred to the services of the Karáchi Municipality.

11. Progress has been made in strengthening the subordinate staff, but the difficulty of obtaining trained assistants in sufficient numbers will not be overcome for several years. All the six men, who obtained the degree of agriculture in December 1904-05, were taken into the Department and in addition some 12 other applicants who possessed a smattering of agricultural knowledge were entertained. Since many of our experiments are ruined by the incompetency or inattention of the subordinate staff, it is with much satisfaction that I am able to report that the students who entered the agricultural course of the College of Science, Poona, last January numbered nearly 50, being seven times as numerous as the numbers which were attracted to this course four or five years ago. In a few years we shall be able to select our material instead of having to accept every person who applies.

12. In the course of the year I visited 12 districts and Mr. Westropp visited five. In January I attended the first meeting of the Imperial Board of Agriculture held at Pusa in Behar and on my return journey made certain enquiries in the United Provinces.

13. The chief subjects on which I have submitted special reports to Government are enumerated below:—

(1) Scheme for the development of the Agricultural and Veterinary Departments.
(2) Plans for the Agricultural College, Poona, and Veterinary College, Bombay.
(3) Establishment of a farm at Dhulia.
(4) Do. farm, Muwalia, Panch Mahals.
(5) Do. Economic Garden, Bassein.
(6) Do. Cattle Breeding Farm at Sholápur.
(7) Review of the sewage experiments near Poona.
(8) Re-organisation of the Subordinate Civil Veterinary Department staff.
(9) Establishment of Veterinary Dispensaries under the Pratt benefaction at Bijápur, Sholápur and Godhra.
(10) The improvement of the Bombay Veterinary College.
(11) Proposals for the improvement and extension of cotton cultivation in India.
(12) Bombay Agricultural Exhibition.

CHAPTER II.

Agricultural Farms and Special Enquiries.

14. Throughout the year the following nine stations were in the charge of the Department:—

(1) Kirkee, Poona, *Deccan* (General experiments and Dairy Farm).
(2) Mánjri, Poona, *Deccan* (General experiments principally sugarcane).
(3) Dhulia, Khándesh, *Deccan* (General experiments principally cotton and jowár).
(4) Surat, *Gujarát* (General experiments principally cotton).
(5) Nadiád, Kaira, *Gujarát* (General experiments principally millets and tobacco).
(6) Dhárwár, *Karnátak* (General experiments principally cotton and millets).
(7) Mirpur Khás, Thar and Párkar, *Sind* (cotton and irrigational station).
(8) Lonávli, Poona, *Deccan* (Rice experimental plots).
(9) Ganesh Khind Gardens, Poona, *Deccan* (Botanical Research).

15. Good progress was made in getting the new farms at Dhárwár, Nadiád and Mirpur Khás into working order. Though a large extension of farms is yet required in order to investigate the numerous varieties of soil and climate existing in this Presidency, we have now for the first time at least one completely equipped farm in each of the chief agricultural divisions excepting only the Konkan, and this last deficiency is being supplied in the year now current.

16. There has been a considerable advance in the equipment of the farms.

At Dhárwár a very satisfactory set of farm buildings has been constructed at a cost of Rs. 20,700 and at Mánjri the area has been extended from 45 to 62 acres and in addition to the meagre provision previously existing a complete set of farm buildings is being constructed at a cost of Rs. 26,600.

At Dhulia, where Government have sanctioned the establishment of a new permanent farm, buildings on the model of those at Nadiád have been commenced at an estimated cost of Rs. 8,000.

At Mirpur Khás buildings of a special design adapted to Sind are in course of construction at an estimated cost of Rs. 17,500.

Sanction has also been received to the establishment of a farm on the Muvália Tank at Dohad for the investigation of the primitive agriculture of the Panch Maháls.

Proposals have also been made for the establishment of an economic botanical garden at Bassein in the Thána District.

17. A detailed account of the experiments on the existing farms has been published in the Annual Report on the Experimental Farms in the Bombay Presidency which is on sale at the Government Book Depôt, Bombay, at the Indian price of 14 annas and English price of 1s. 4d. A summary is attached in the appendix to this report.

18. I give below a brief explanation of some of the principal objects of these experiments :—

Cotton.

Cotton is perhaps the most important of our experiments. It covers in British territory an area of 3 million acres out of a total cultivated area of 27 million acres and in Native States another 2 million acres; in British districts alone its value exceeds six crores of rupees, a sum largely in excess of the whole revenue demand of the Presidency. From the produce of the cotton crop alone, if it were equally distributed throughout the Presidency, the whole of the revenue could be paid and an ample margin would remain. In last year's report I published a note regarding the possibilities of the extension of area and improvement in quality of cotton grown in the Presidency. This year's work has been directed to —

(1) the introduction of Egyptian cotton into Sind ;

(2) the introduction of a tree cotton into the Western Karnátak ;

(3) the introduction of Broach cotton into irrigated tracts in the Deccan and Karnátak ;

(4) the improvement of Gujarát and Khándesh cottons by hybridization and selection at Surat, Jalgaon and Dhulia ;

(5) distribution of selected cotton seed in Ahmedabad and Dhárwár.

Cultivation of Egyptian cotton in Sind.

19. The most successful portion of the operations of the Department during the year has been the cultivation of Egyptian cotton in Sind. Last year I reported the successful results of the first experiments made in sowing Egyptian cotton in the spring so as to enable it to mature before the advent of the winter frosts. This year Mr. Fletcher obtained and distributed to selected Zemindárs on the Jámráo Canal 10 tons of Egyptian seed with which some 1,500 acres have been sown by the Zemindárs. The yield is reported to be very satisfactory both in quantity and in staple and the Zemindárs are anxious to extend its cultivation on a large scale. It is believed that this cotton is more likely to retain its superiority of staple if Egyptian methods of cultivation are closely followed and in order to ensure this it is proposed to restrict the cultivation to those Zemindárs who undertake to sow it under supervision and whose

lands can be practically supervised. The two Egyptian cottons, which have proved most successful in growth, are the Abassi and the Mitaffiffi of which the former is far more valuable. Arrangements are therefore being made to export the seed of Mitaffiffi grown this year and to import a sufficient consignment of Abassi seed from Egypt. No signs of deterioration have been observed in the crop of the second year and it is remarkable that while the local indigenous variety suffered severely from attacks of Boll-worm the imported Egyptian varieties were almost immune. If the cultivation in the coming year is equally successful, the matter may be said to have left the region of experiment and an outturn of not less than 100,000 bales may be expected in the course of a few years.

Tree cotton in Karnátak.

20. Another interesting experiment in cotton is in progress of a different variety and under totally different conditions. A gentleman, residing at Belgaum, Mr. F. W. Tytler, has succeeded in the last four years in growing in his compound Peruvian cotton of a staple which has been valued at 7½ pence per pound. Mr. Tytler applied to the Inspector General of Agriculture for assistance in demonstrating the suitability of this cotton for cultivation in large areas in the forests of the Karnátak Ghâts. Terms were arranged in discussion with Mr. Tytler by Mr. Westropp and myself and a grant of Rs. 5,000 was made by the Government of India and the experiment was placed under the supervision of the Deputy Director of Agriculture. The plants were grown in a nursery and were transplanted in June in 130 acres of forest land which were granted to Mr. Tytler. Unfortunately the monsoon this year at Belgaum has been almost unprecedentedly short (28 inches having fallen up to 31st October last, against an average of 52 inches), some of the plants have died and all have been stunted in growth, but it is hoped that the experiment may yet prove successful.

Irrigated cotton in the Deccan.

21. The cultivation of cotton under irrigation in the Deccan and the Karnátak is almost unknown. Experiments conducted on the Mánjri Farm for the last three years have shown that long-stapled cotton of the Herbaceum type can be cultivated with success. In December 1904 I issued a circular calling the attention of Collectors and Executive Engineers to these results and requested them to persuade enterprizing land-holders who were willing to conduct an experiment to cultivate small areas with Broach cotton. Mr. Fletcher prepared a leaflet of instructions which was translated and distributed and on application made to the Surat Farm some 9,000 lbs. of seed were distributed gratis, nearly half the quantity to the districts of Poona and Bijápur.

Owing to the prevailing ignorance of the treatment of this crop under irrigation the experiment will probably require several years before complete success can be attained, but there is reason to believe that it should be a valuable crop for rotation with sugarcane, a very important desideratum, and the attempt to secure its general introduction should be persevered in.

Selection and hybridization of indigenous varieties.

22. Further experiments are in progress to improve the existing local varieties by selection and hybridization at Dhárwár in regard to the Kumta and Dhárwár American varieties; last year at Jalgaon, and now at Dhulia in regard to the Khándesh; at Surat in regard to the Surat and Broach, at Nariád and at Chharodi near Ahmedabad in regard to the Northern Gujarát and Káthiáwár varieties. Good results were obtained last season, but in the current year the failure of the monsoon at Dhárwár and the cyclone in July at Ahmedabad destroyed the selected plants and the work there must be begun again. At Surat a considerable number of improved plants have been obtained and the extension of the farm is required and will shortly be effected in order to enable the improved varieties to be grown on a sufficient scale to permit the commencement of the distribution of the seed produced on the farm.

23. In connection with the general demand for the immediate improvement of Indian cotton the Government of India suggested that cotton should be selected from the fields of cultivators, purchased by Government, ginned under special precautions and the seed distributed for sowing.

The experiment was tried in the Dhárwár and Ahmedabad Districts, where seed sufficient to sow 8,000 and 3,500 acres respectively was distributed.

It is permissible to hope that the demonstration of the superiority of the produce of the selected seed may teach the more intelligent cultivators to select their seed with greater care than they exercise at present, but scientific opinion does not support the view that any permanent improvement either of staple or yield can be effected otherwise than by plant to plant selection.

Sugarcane.

24. The sugarcane crop in this Presidency is of small importance as regards area but of considerable importance in regard to value. The United Provinces of Agra and Oudh have a million and a quarter acres under sugarcane and the Punjab and Bengal together have an equal acreage. We have only some 60,000 acres, but while their cane is largely grown without irrigation, and even when irrigated produces an outturn of not more than 2,500 lbs. of gul per acre, the Bombay cane is always irrigated and produces an average outturn of 7,000 lbs. of gul; with sufficient manure and skilful cultivation near Poona the outturn is known to reach even 15,000 lbs. The cane crop pays a considerable part of the irrigation revenue on canals and is one of the most remunerative investments open to capital in Western India, the average net profit being reported to be about Rs. 150 per acre. Experiments have been in progress regarding the best methods of cultivation of this crop for 10 years and important conclusions have been published by Mr. Mollison and a pamphlet issued this year by Mr. Knight. These conclusions are—

(1) that excessive irrigation is ordinarily applied by cultivators from canals;

(2) that water to the amount of 2½ to 3 inches of rainfall should be applied every 8 to 10 days;

(These conclusions now regulate the practice of the Irrigation Department.)

(3) that the amount of nitrogen supplied per acre in manure should be about 350 lbs.;

(4) that this can economically be supplied by oil-cakes;

(This discovery has greatly influenced sugarcane cultivation around Poona.)

(5) that the Poona system of cultivation in beds is better suited to the local cane than the system adopted from the Mauritius.

Various other conclusions of minor importance have been obtained and published. The interest aroused by these experiments is shown by the large demand from all parts of India for the pamphlet recently issued by Mr. Knight and by numerous applications for sets of sugarcane for plantation. The Sannabile cane first introduced from this farm into Behar is understood to be now cultivated there on a considerable scale. Further experiments are now in progress to ascertain whether mineral fertilizers, such as nitrate of soda and nitrate of potash can also be applied with advantage. The importance of applying nitrogen in the early stages of growth by means of a fertilizer which is more rapid in its action than farm-yard manure or poudrette is emphasised by Mr. Knight and in his opinion the possibilities of potash have not yet been worked out.

Groundnut.

25. This crop formerly covered 180,000 acres and in 1895 its export amounted to 800,000 cwt. valued at over Rs. 55 lákhs. Its cultivation has decreased suddenly and completely since 1896 and last year amounted to 77,000 acres with an export of 42,000 cwt. This decrease has been the subject of solicitude to the Bombay Chamber of Commerce, who under the impression that the decrease is entirely due to a disease affecting the indigenous variety have frequently advocated the importation of foreign seed. Experiments have been in progress on our farms for several years with varieties obtained from Pondicherry, Virginia, Spain, Japan and Mauritius, but no variety has been found to be less susceptible to this particular disease than the indigenous variety. On the other hand it is probable that by far the greater part of the decrease is due to the constant scarcity

of rain in the last ten years which has operated—firstly, in drying up the hill streams on which much of the cultivation previously depended; secondly, in lowering the level of the sub-soil water and diminishing the area under irrigation from wells; and thirdly, in inducing cultivators to grow grain to replenish their depleted food-supplies in preference to growing crops for export.

It may be observed that the crop is almost unknown in the Southern Mahrátta Country, in Northern Gujarát and in Sind. It is being grown with fair success on our farms at Dhárwár, Nadiád and Mirpur Khás and there are good grounds to hope that the Department may succeed in introducing this valuable crop into the cultivation of these regions. In some localities otherwise suitable to this crop the ryots are unable to grow it on account of the ravages of wild pigs who are especially partial to nuts. At Surat it has been found that the Pondicherry and Virginian varieties are usually more prolific than the local variety and the local cultivators have shown their willingness to take up the new varieties of which seed has been distributed to them.

Jowári.

26. Jowári covers an area of 9 million acres and is the chief food-grain of the people. Any improvement of this crop will therefore be of widespread benefit.

In regard to its cultivation there is probably nothing which we can teach the ryot, but the avoidance of smut in years of heavy rainfall would be a great advantage and on all the farms demonstration is regularly given that if the seed be steeped in a solution of copper-sulphate (which is obtainable in every small bazár) it can be saved from this disease at a cost of ½ anna per acre. This advice has been promulgated throughout the country by leaflets issued to all Collectors in Gujaráti, Maráthi and Kánarese and by repeated communications to vernacular newspapers.

Further, it is possible that the superior jowári of certain tracts may be found to be suitable to other tracts where they are at present unknown. High class Gujarát varieties have thus succeeded excellently on our Khándesh farms and at Dhárwár and the seed has been eagerly taken up by neighbouring cultivators.

Rice.

27. The institution of new experiments at Lonávli in order to obtain a fertilizer for rice in substitution for the existing system of ráb cultivation was noted in my last report. These experiments have been continued but no conclusion can yet be stated.

Tobacco.

28. Tobacco is a crop which like sugarcane covers an area of under 100,000 acres, requires high cultivation and when successful can pay a profit of over Rs. 100 per acre. It is of special importance in the districts of Kaira and Belgaum. Twenty years ago a series of experiments were made at Nadiád by Government and by Sardár Bechardas Viharidas, but after several years of vain endeavours to improve either the cultivation of the plant or the curing of the leaf by European methods were discontinued. The Government of India now propose to import a tobacco specialist and to make new experiments at Pusa. The experiments in cultivation are being renewed at Nadiád by Mr. Fletcher and a curing house is about to be constructed with funds provided by the Imperial Government.

Wheat.

29. Wheat on an average occupies a couple of million acres. The varieties vary very greatly, not only in commercial value but also in their suitability to different conditions of climate and soil. As a general rule the best varieties are also the most delicate and the most susceptible to damage by rust. Many attempts have been made in the past to import superior varieties into new tracts but with unvarying failure. The problem is now being attacked by more deliberate and scientific methods. Last year we grew on the Poona and Mánjri Farms 460 varieties, and a botanical classification by Professor Gammie is nearly ready for publication. Numerous varieties are being grown on all the farms to ascertain whether any variety superior to the indigenous varieties is equally suitable to the local conditions of soil and climate. At the same time selection of seed is in progress and experiments in hybridization are being conducted with a view both to improve the quality and obtain a rust-proof variety.

Manurial Experiments.

30. Mineral fertilizers are little used in this country. Owing to the want of demand the supply is at present expensive, but if a large demand were created it is probable that cheap

supplies would become available; Messrs. Fletcher and Knight have set on foot new experiments with regard to such fertilizers as Nitrate of Soda and Nitrate of Potash. The results are so far inconclusive.

Rotation experiments.

31. The general result of rotation experiments is to demonstrate the soundness of the local practices in tracts where the cultivation is so good as in Surat, Nadiád and Dhárwár. But in Sind and the Panch Maháls where the cultivation is primitive and in the new canal tracts (where as a rule irrigation is as yet little understood) our farms may prove centres for the diffusion of valuable improvements in practice. The point is not yet definitely determined, but experience at Manjri shows in the opinion of Mr. Knight that both cotton and tur will prove to be suitable crops for rotation with sugarcane: tur being a leguminous plant, is of special value for the improvement of the physical condition of the soil and the restoration of the stores of nitrogen; and in Sind Mr. Fletcher considers that the introduction of bersim or Egyptian cloves (similarly a leguminous plant) will be of great assistance in saving the cotton lands from deterioration.

Cultural methods and introduction of implements.

32. Here again we have found much difficulty in improving on the local practices of the best cultivators. Almost in every village good and bad cultivation will be found side by side and where it is bad it is usually a case of "Video meliora proboque, deteriora sequor." The Bhil and the Koli who have not learnt the practices of the Kunbi and the Pátidár by centuries of observation will not be easily influenced by Government agency, but even the Kunbi and the Pátidár have seen and have adopted some useful implements from our farms. In Dhárwár black soils are infested with the deep-rooted kunda grass which can only be eradicated by hand-digging with pickaxes. The cleaning of such land on the farm by the heavy iron turn-wrest plough attracted much attention; several exhibitions were held for the benefit of local landlords and a considerable number of such ploughs were sold both from this farm and from the Poona and Surat farms. So also the economy of fodder obtained by cutting kadba (jowári straw) into chaff has attracted general attention on all the farms and many of these useful implements have been distributed not only this year but also in former years.

Septic effluent and sewage farms.

33. At the close of 3 years' experiments with septic effluent at Manjri, the operations were discontinued on the advice of the Inspector General. A separate report has been submitted showing the agricultural prospects of a farm if one be established in connection with the sanitary system of the Poona City. The report prepared by Mr. Knight will be issued as a bulletin of the Department on sale.

The Municipal Sewage Farm at Karáchi continues to be remarkably successful in spite of the difficulties experienced from the very short supply of water in the city. At Ahmedabad the Municipal Sewage Farm has been removed to a new location, but is reported to be making little progress towards efficiency.

Botanical work.

34. Difficulties have hitherto been experienced in regard to the experiments in the several provinces of India and even on the farms of each province from the want of a uniform botanical classification. Plants which are botanically identical are called by numerous varying local names. The importance of correlating the results of the experiments made in the several provinces is obvious and to this end a great deal of work on our farms has been directed, especially at Poona and Manjri, under the immediate supervision of Professor Gammie. The chief subjects dealt with were cotton, jowári, tur and rice, but many other crops and varieties were forwarded by the Inspector General of Agriculture for cultivation and examination. On one of these two farms 1,110 local varieties were grown during the year, a fact which evidences both the enormous detail of the work conducted on these farms and a gratifying recognition of its value by the Imperial authorities.

Special experiments.

35. Other special experiments were made in the cultivation of tapioca and indigo (these being at the request of the Inspector General of Agriculture) and in the Ganesh Khind Botanical Gardens on rubber, camphor and vegetables.

36. The herds of cattle have been much improved by the removal of inferior animals which have been carefully selected by Mr. Knight from the records of milk yield. The details given in the farm report of the experiments regarding the effect on the milk yield of various methods of feeding should be of interest and value to practical dairymen.

Poona Dairy.

CHAPTER III.

Entomology and Mycology.

Entomology.

37. Since the sudden appearance of enormous swarms of locusts of the Acridium Succinctum species in March 1904 constant attention has been given to the movements of this insect and we now for the first time possess an accurate knowledge of its life history. A pamphlet on the subject is being published by Mr. Lefroy, Entomologist to the Government of India. We know now that they breed in May and June and lay eggs in June and July, mostly in the Deccan Ghats and in the country around the Satpura hills; that hoppers appear in August and September and assuming wings in October develop the gregarious instinct and proceed to fly over the country in November. When the cold has set in over the Deccan, they turn southwards and find shelter in the inaccessible forests in Kánara, Goa and Sáwantwádi, whence they emerge in March and April and again fly northwards and eastwards. Their numbers are kept in check by numerous natural agencies of which we know little; in the hopper stage they are devoured by frogs, ants, lizards, &c.; when full grown they are subject to parasites such as the tachinid fly and the flying swarms are attacked by numerous birds, especially kites, crows and the rosy pastor.

38. In the autumn of 1904 measures on a large scale to destroy the hoppers were taken by the Revenue Department and some 2 lákhs of rupees were expended in rewards, the total quantity destroyed amounting to 500 tons. The difficulty of dealing with this pest was described in my report of last year and it is impossible to be sanguine as to the ultimate effect in checking the plague of all the labour and money expended on these operations, but when the rewards are limited to the destruction of hoppers one considerable public advantage is secured. It is at this stage that they do the greatest amount of localised damage and since the hoppers develop chiefly in hilly tracts and devour the crops of the hill tribes, who alone have no religious scruples in regard to their destruction, the employment of the hill men on the destruction of the hoppers serves the double purpose of obviating the necessity of measures of public relief, and of diminishing the numbers of the locusts in the only conditions in which human agency appears to be of any avail. The conditions of the late autumn of 1904 appear to have been for some unknown reason unfavourable to the young locusts and few reports were received of swarms visiting the Deccan in November and December. Some swarms however settled in the Southern Konkan and were next observed in March and April 1905 issuing in diminished numbers. It was remarkable that they did not revisit the ghâts north of Kolhápur where in the previous year they were found in the greatest numbers, but bred in the southern portion of Ratnágiri and in isolated tracts in the Khándesh District and on the borders of the Central Provinces. From these places swarms have again issued in October 1905 and are at the time of writing reported to be flying over most of the districts of the Deccan and the Karnátak, but at this season of the year the damage that they effect is inconsiderable.

39. The plague of grass-hoppers at Belgaum continues to cause some local damage. Their life history is now being observed and is not yet definitely settled, but it appears to differ in some remarkable points from that of the allied species of locusts. It is believed that they lay their eggs in November which remain dormant until the rains break in May or June. The hoppers then develop, assuming their full size in September, and die off in November and December. The cultivators refuse to take any action towards their destruction even to earn

the rewards offered by Government. Their apathy is probably due to religious scruples against the taking of life, but it is difficult to protect men from the consequences of their beliefs. An enterprising Mámlatdár imported some poultry to devour the hoppers, but they rapidly died, it is surmised, from the richness of the diet and a surfeit of indulgence.

40. Various experiments in the destruction of insects have been made on the farms, but as yet with no definite result.

Mycology.

41. The fungus diseases of groundnut and tur were still under examination by Dr. Butler, Imperial Mycologist.

CHAPTER IV.

Agricultural Education.

College of Science.

42. A great advance has been made towards the efficient teaching of agriculture by the sanction above noted to the permanent appointment of Mr. Knight, Professor of Agriculture, to the transfer of Professor Gammie as Economic Botanist to this Department and to the creation of a post of Agricultural Chemist. These appointments and the Imperial subvention of Rs. 3½ lákhs per annum have now rendered it possible to establish a separate College of Agriculture. The project has received the sanction of this Government and the Government of India and plans and estimates are in course of preparation. An excellent site has been selected at Poona and is being acquired half way between the Deccan and Fergusson Colleges and close to the College of Science.

43. The College will also be a Research Institute and it is hoped that by the time the buildings are completed the Presidency will have obtained the services of an Entomologist and a Mycologist as well, and the interests of agriculture will be served by an adequate staff fully equipped. In order to give the superior staff leisure for research a considerable portion of the teaching of the students will be conducted by native Professors of good standing. It is anticipated that the College will eventually have 200 students. Since the grant of certain privileges in the Revenue service to Agricultural Graduates the number of applicants have doubled each year and last January 50 new students were admitted several of whom for the first time came from Sind. The inclusion of the Superintendent, C. V. D., in the new Research Institute has been sanctioned by Government and his supervision and influence may be expected to improve the veterinary side of the agricultural training which has hitherto been somewhat defective, while he will also be provided with a laboratory for experimental work of which there is great need.

Training College.

44. The farms for the training of agriculture for the Colleges of Ahmedabad and Dhárwár are in working order. Land has also been acquired for the Hyderabad College and a probationer from Sind has been trained for the post of teacher. The farm is about to commence work shortly. For the Poona College it is proposed that provision should be made in the scheme of the Agricultural College.

Educational Publications.

45. The agricultural lessons for rural schools which have been prepared by Mr. Knight have been revised and translated into Maráthi in consultation with a committee of the Educational Department, and are being published in English and Maráthi. They will shortly be ready for distribution. A hand-book on agriculture prepared from Mr. Mollison's work by Mr. P. R. Mehta is also in the press.

46. A class for the instruction of Junior Civilians in elementary knowledge regarding the agriculture of the country was again held by Mr. Knight. Government have directed that a certificate of attendance at this course should in future be obtained by all officers.

CHAPTER V.

Publication of Agricultural Information.

47. The annual season and crop report has been separately published, containing the agricultural statistics of the Presidency and the preliminary and final forecasts on wheat, cotton, sesamum, groundnut, linseed and rapeseed have been issued from time to time.

48. Much attention is being now given to the distribution of information. For some years after the creation of this Department the officers were engaged in research and in training their staff and wisely refrained from premature attempts to give advice which might have proved erroneous. It is only recently that, thanks to the sound foundations of the work of our predecessors, we can confidently offer the cultivation of our farms for comparison with any cultivation in the neighbourhood; and can undertake now with the help of a trained staff to bring to the notice of the rayat exotic crops and Western ideas and inventions adapted to the conditions of his cultivation. The best means of reaching the rayat has been the subject of much discussion. In some provinces a Vernacular official magazine is preferred. In this Presidency, in my opinion, nothing is of so much value as the personal interest of district officers and the distribution through their agency of leaflets advocating special measures. The Vernacular press which probably has a wider circulation in this Presidency than in most parts of India also reaches the higher class of land-owners, and has shown itself very ready to lend its assistance. From the numerous enquiries which are addressed to the officers of this Department, I am confident that our experiments are being keenly watched and criticised by many intelligent observers.

49. Mr. Fletcher issued leaflets, which were translated into Sindhi and Hindustani, regarding the cultivation of (1) Egyptian cotton in Sind, (2) Groundnut, and (3) Egyptian clover. These were distributed widely through the District Officers. Mr. Fletcher also issued instructions regarding the cultivation of irrigated cotton in the Deccan and Karnátak, which were translated into Maráthi and distributed through Collectors and Executive Engineers.

Mr. Knight re-issued a leaflet on the prevention of bunt and smut in jowári by the steeping of the seed in a solution of copper sulphate, of which 8,000 copies were printed and distributed to Collectors. Mr. Knight also published a bulletin on the cultivation of sugarcane which has been communicated to 17 English and 42 vernacular newspapers.

50. I wish to take this opportunity of correcting an error in my report of last year which appeared to be prejudicial to Mr. Lefroy, the Imperial Entomologist. The leaflet prepared by Mr. Lefroy which was translated into Gujaráti and of which English and Gujaráti copies were distributed warned cultivators of the importance of eradicating the first canes of a sugarcane crop which were attacked by the moth borer insect. The suggestion regarding the cultivation of a fringe of sorghums around the sugarcane was not published in a leaflet, but was forwarded to the Experimental Farms for the purpose of experiment. By a lapse of memory I confounded this suggestion with the former leaflet and exposed Mr. Lefroy to the unfounded accusation of publishing ineffective recommendations.

51. Bulletins containing a classified list of cultivated crops by Mr. Symonds, I. C. S., and showing the dates of sowing and harvesting of principal crops in the Presidency, have been published and appear to meet a public want.

52. A District Agricultural Association has been formed at Dhárwár through the kind offices of Mr. J. McNeill while acting as Collector there. The Superintendent of the Dhárwár Farm has been appointed Secretary and the members give promise of showing much intelligent interest in the experiments of the farm and of attempting to repeat them on their own lands. At Poona and Sátára the proposed Associations are, I regret to state, still in the region of discussion by the native gentlemen who undertook the enterprize.

53. Mr. Kelkar, the Divisional Inspector for the Deccan, made several tours for the purpose of giving advice and exhibiting implements and selected seed. His lectures were readily listened to and his seed was taken. It has also

been impressed upon all Superintendents of Farms that one of their chief duties is to establish relations with the cultivators of the surrounding country, to induce them to visit the farms, and to advise them in regard to their cultivation. To this end Superintendents have been encouraged to make short tours when agricultural operations have allowed them to leave their farms; and have been deputed to attend local fairs. Mr. Kulkarni at Dhárwár has shown the greatest aptitude in this branch of work.

54. An important opportunity of publishing agricultural information was offered by the Agricultural Exhibition which formed a part of the Exhibition held in connection with the National Congress in December 1904 and January-February 1905. A programme was prepared in consultation with the Honourable Mr. Vithaldas D. Thackersey, Chairman of the Exhibition Committee, and Mr. Knight was entrusted with the general management of the Agricultural Section. The exhibits were divided into 6 main heads :—

1. Samples of all soils of the Presidency and of manures, natural and artificial.

2. Specimens of all kinds of agricultural tools, implements and machinery.—This included both indigenous implements from every part of the country and also implements of European and American manufacture.

3. Vegetable products, prepared and unprepared, for the market.

4. A working dairy.

5. Milch and work cattle of various breeds.

6. Model cattle byres.

55. An exhibit of special importance which attracted much attention from mill-owners and the cotton trade was a bale of Egyptian cotton of exceptional quality which was sent from the Government Farm in Sind where this variety had been grown for the first time with success. Since the mere inspection of many of these exhibits naturally conveyed little meaning to visitors, arrangements were made for the constant attendance in each portion of the Exhibition of trained native assistants of the department to explain to persons interested, in their own language, the objects and meaning of all articles exhibited. A staff of these assistants speaking English, Maráthi, Gujaráti, Kánarese and Sindhi was kept constantly in attendance, and their services were freely availed of by numerous enquirers.

Over 500 cultivators were brought to the Exhibition, of whom some 300 were sent by Government officers at Government expense. Some 70 came at their own cost but with introductions from Government officers, and the remainder came from other provinces and Native States. The deputation of these men was an unqualified success. They were very well selected by the District Officers and showed their intelligence by the interest with which they examined the specimens exhibited, the keenness with which they followed the lectures and the very pertinent questions which they put to the lecturers. In some instances they were so impressed with the Exhibition that they telegraphed to their homes and brought several others of their relations and friends ; while very large numbers of cultivators were seen to visit the Exhibition in subsequent weeks.

56. Government were also pleased to issue instructions to the Collectors of the districts shown in the margin to send a deputation of weavers to inspect the improved looms which were being shown at work. Thirty-five weavers were thus deputed and were received and shown over the Exhibition by the Agricultural Staff. Several of them were seen to take notes and sketches of the improved looms and made numerous enquiries regarding their prices.

Ahmedabad, Surat, Ahmednagar, Bijápur, Khándesh, Násik, Sholápur and Poona.

The Department was awarded a gold medal and a diploma by the Committee of the Exhibition for the " general excellence of their exhibits." The total cost to Government amounted to Rs. 7,800, of which Rs. 2,200 were spent on the deputation of agriculturists.

57. In September 1904, a Conference was held at Poona which was attended by representatives of the Chambers of Commerce of Bombay and

Karáchi, of the Millowners' Association and the Natural History Society. The Honourable Mr. Lamb, Secretary to Government, presided and there were also present some 20 gentlemen, European and Native, interested in agricultural research, and the officers of the Department. Reports of the work of the department were placed before the Conference, and were criticised and discussed. A Resolution was submitted to Government by the unofficial members of the Conference, advocating the strengthening of the Department and the efficient equipment of Laboratories for research.

I have the honour to be,

Sir,

Your most obedient servant,

H. S. LAWRENCE,

Director of Land Records and Agriculture.

APPENDIX.

Operations on the Farms and Gardens in the Bombay Presidency.

Surat.

The rainfall was one-third of the average and was badly distributed. The net cost of working the farm and the dairy rose from Rs. 2,658 in the previous year to Rs. 8,959. The increase is attributed by the Deputy Director to the necessity of purchasing fodder for the cattle, but it is observed that the principal cause is the decrease in receipts from Rs. 5,892 to Rs. 1,585.

2. The dairy herd increased from a strength of 86 animals to 108. In accordance with the orders passed in Government Resolution No. 3352, dated 25th April 1905, the number has since been reduced.

3. The demand on the farm for seeds and implements increased satisfactorily. Over 9,000 lbs., chiefly of cotton and groundnut, were distributed, and 112 implements and several English ploughs. There was again a demand for good Gujarát bullocks from other provinces.

4. An attempt was made to demonstrate the value of mineral manures on the lands of cultivators, but it was frustrated by the failure of the monsoon and of the crops.

5. Experiments were also made in regard to—

(1) Selection of cotton seed.
(2) Application of mineral manures.
(3) Cultural methods for cotton.
(4) Insecticides of cotton.
(5) Prevention of smut on jowári.
(6) Rotation and local manures.

But in all these cases the results were vitiated by the conditions of the season.

6. The experiments with varieties of groundnut were continued and Pondicherry and Virginian nuts again showed a superiority in this district over local nuts.

7. The hybrid cottons were preserved from destruction by irrigation. Mr. Fletcher is of opinion that considerable progress has been made towards securing an improvement in the quality of the Surti-Broach growth.

Nadiád Farm.

8. This being the first year of work the operations were of a preliminary character. The rainfall was one-third of the average and fell almost entirely in the 3 months—July, August and September. In consequence no results were obtained from the experiments on the farm. The experiments in the distribution of nitrate of soda to cultivators for application to tobacco appear, however, to promise success.

9. From funds supplied by the Government of India an oil engine with a pump was placed on a well and experiments are in progress to test its economy in comparison with bullock power. Many enquiries on this subject are received from the enterprizing cultivators of Kaira.

10. Preparations have been made for the conduct of irrigational experiments by actual measurements of water. The local Nadiád Association continued to take much interest in the farm and Mr. Fletcher expresses his indebtedness for their encouragement and advice.

Dhárwár Farm.

11. The rainfall was slightly below the average and the late rains were also deficient.

12. The demonstration of the value of steeping jowári seed in a solution of copper sulphate was successful and instructions regarding this method of treatment have been issued to cultivators by the Collector and by the Dhárwár Agricultural Association.

13. Manurial experiments were tried in regard to the application of lime to soil in a bad physical condition, and of nitrate of soda to jowári and cotton. Mr. Fletcher concludes that this manure is too expensive for crops of low value.

14. In varietal experiments Broach cotton and Gujarát jowári gave a better yield than the local varieties. But this result may be due to the unusually light rainfall of September and October.

15. Experiments were commenced as to the best time of sowing the Kumpta and Dhárwár American cottons, but no conclusion can be formed for several years.

16. The farm is already an object of keen interest on the part of local cultivators and has been instrumental in distributing 12 English ploughs and 60 chaff-cutters.

17. The expenditure of the farm was about Rs. 10,681. The farm produce is valued at Rs. 2,082, and after deducting the value of live and dead stock the net cost to Government was Rs. 3,741.

CHHARODI FARM (AHMEDABAD DISTRICT).

18. The season was similar to that of Nadiád. Some good hybrid cotton seed was obtained, but has subsequently been lost in the cyclone that occurred on the 23rd July 1905. Operations have been temporarily abandoned.

JALGOAN FARM.

19. Hybrid cotton seed was obtained and is now being grown on the new farm at Dhulia. The Chapti variety of jowári again proved its superiority over the local jowári.

DHORO NARO FARM.

20. The cultivation of Egyptian and American cottons was most successful. The average yield of Egyptian cotton sown in April exceeded 1,100 pounds of seed cotton per acre and was valued at 5 to 7¼ pence at the date when the valuation of Fine Broach and Fine Sindhi cotton was 4⅛ and 3½ pence per lb. The American cottons were valued at about 4¾ pence per lb. Mr. Fletcher estimates that the best Egyptian variety is more profitable to the cultivators by about 250 per cent. than the local variety, producing a net profit per acre of Rs. 190 as against Rs. 75.

21. The net cost of the experiments is reported to be Rs. 1,173.

MIRPUR KHAS FARM.

22. This farm was opened in October 1904. In the rabi season Egyptian clover was successfully grown and experiments in regard to the irrigation of wheat were initiated. Groundnut has also been introduced.

23. The expenditure of starting the farm exclusive of buildings is Rs. 4,307.

POONA FARM.

The rainfall was 15 inches against an average of 29.

24. The farm was chiefly used for botanical work and the instruction of students of the College of Science. The gross expenditure rose to Rs. 6,889 and the net cost to Rs. 5,138.

25. 1,110 varieties of crops in all were grown, largely at the instance of the Inspector General of Agriculture for the purpose of furnishing seed to experimental farms in all parts of India.

26. Mr. Gammie carried out botanical classification in regard to cotton, jowári, wheat, rice, cucurbitaceae, brinjals, chillies and sweet potatoes.

27. Experiments in regard to the fungus disease of groundnuts were continued, but do not yet give promise of success.

28. Seventeen English and American ploughs and six chaff-cutters were distributed from the farm.

POONA DAIRY.

29. The scarcity of rain seriously affected the dairy. The pasture produced little grass and the fodder grown on the farm was scanty. A severe attack of cattle disease diminished the yield of milk and the sickness was increased by the want of sufficient green fodder.

30. The quality of the herd has been much improved by the removal of inferior animals which were carefully selected by Mr. Knight from the records of milk yield. The number was reduced from 236 to 189, and a small herd of Gir cows was obtained for the purpose of comparison.

31. While last year a number of individual cows were kept at a loss, this year, in spite of the unfavourable season, every animal, except four new arrivals, shows a profit. If the cost of purchasing new live stock be excluded the profit of the dairy amounted to Rs. 907.

32. A number of experiments were made in regard to the effect of various kinds of fodder on the yield of milk.

33. The average profit per cow was Rs. 89, per buffalo Rs. 73. Amongst cows a Sindi takes the first place, and amongst the buffaloes the Houda (cross) with a net profit of Rs. 229, the average daily yield per cow being 8 lbs. 1 oz., per buffalo 11 lbs. 3 ozs.

34. Experiments in regard to the castration of young Deccan bulls are being carried on at the Mánjri Kuran in connection with the dairy.

MANJRI FARM.

35. The farm has been extended by the purchase of 17 acres and new farm buildings are in course of construction.

36. The rainfall was very scanty amounting to less than 12 inches against an assumed average of 22.

37. A complete statement of the experiments in progress is contained in the annual report. No new conclusive results have been ascertained.

38. The experiments in regard to sugarcane are being followed with great interest in all parts of India. Mr. Knight published a pamphlet on sugarcane cultivation which is in great demand. Mr. Knight concludes that the surplus supply of nitrogen in the manure makes the cane more juicy without increasing the sugar to a corresponding extent.

39. At the instance of the Inspector General experiments are being conducted in the cultivation of tapioca and the extraction of the starch. The plant grows satisfactorily, but requires irrigation.

40. Cultivation of the tur of Northern India (Cajanus indicus) known as Arhar was successful, and it is possible that this crop may be introduced to the Deccan as a rotation crop for sugarcane, "since it renovates the land and grows with little or no irrigation so that the land may rest from irrigation."

41. The success noted last year of the cultivation of long staple Broach cotton on the irrigation was repeated. Broach and Goghári varieties again gave an outturn of about Rs. 70 per acre.

42. A large quantity of seed and cuttings was distributed from the farm including jowári, cotton, beans, maize, bájri, sweet potatoes, sugarcane, Egyptian clover, soy-beans, tur, groundnut, gram, wheat, tapioca, turmeric and ginger. The places of distribution varied from the Deccan to Sind, Madras, Punjab and Bengal.

43. The total expenditure of the farm was Rs. 6,749 and the receipts amounted to Rs. 9,683, representing a net profit of Rs. 2,934.

MANJRI SEWAGE FARM.

44. A separate report has been submitted and will be published. The new sugarcane grew very luxuriantly, yielding over 11,000 lbs. per acre of gul of good quality and even the third year ratoon crop produced over 6,000 lbs. per acre. Surans, groundnuts and ginger were not successful; turmeric and maize gave a good outturn.

45. The cultivation expenditure amounted to Rs. 1,905 and the receipts to Rs. 3,569.

RICE EXPERIMENTS.

46. The rice experiments were seriously injured by crabs which devoured portions of many of the experimental plots. 25 different methods of treatment were tried and details of the cost of cultivation and the receipts from the produce have been carefully reported. It is improbable that any definite conclusion can be formed for several years.

47. The experiments in the application of nitre in the fields of cultivators were continued. There was a considerable increase in the outturn in most cases, but owing to a large increase in the cost of nitre the net gain is small.

GANESH KHIND BOTANICAL GARDENS.

48. These gardens were in the charge of Mr. Gammie throughout the year. Experiments are being conducted in the growth of a large number of indigenous trees and shrubs. Several varieties of rubber are also being grown. The Ceara rubber and Cryptostegia grandiflora give promise of success. Other plants under trial are camphor, agave, yams and numerous fruit trees including citrons, limes, lemons, pumelos, peaches, pears, vines, and pomegranates.

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